



Lesson 4: Oil and Water

In this lesson, students will be introduced to the various sources of water pollution and the importance of water quality.

Focus

Pollution, Separation of Mixtures, and Water Quality

Focus Questions

- What are the causes of water pollution?
- How can we separate water from pollutants?
- Why is water quality so important?

Materials Needed

Our Water PowerPoint
Small Sections of PVC
Soda Bottles
Vegetable Oil
Paper Towels
Catch Bins
Food Coloring
Sand
Wide, clear container

Clear Cups
Spoons/Utensils
Trash Bags
Plastic Drop Cloths
Funnels
Coffee Filters
Gravel
Spray bottle with water

Key Words

Natural Resource, Water Pollution, Water Quality, Mixture, Separation, Environment

Advanced Preparation:

Before the lesson, in a wide and clear container (such as a large jar, fishbowl, or fish tank), pour a 1 to 2-inch-thick layer of sand on the bottom. Then, on one side of the container, layer gravel so that the gravel covers roughly half of the bottom and slopes gently upward. Lastly, pour water into the container. Be sure it is enough to create a “body of water” over the half of the container without gravel, but do not cover all the gravel with water as this is supposed to represent dry land.



Grade Level: 2

Learning Objectives

- Students will be able to explain the sources of water pollution as well as its effect on water quality and the environment.
- Students will be able to develop and use models to exemplify how matter can be mixed and separated again based on the properties of the mixture.

Prior Knowledge Required

- Students should be able to explain the importance of water as a natural resource.

South Carolina Science Standards and Performance Indicators Addressed

2.P.3A.2; 2.L.5B.4; 2.L.5B.3



Engage

While using the *Our Water* PowerPoint as a guide, begin the lesson by asking the students the following questions:

- *What does water mean to you?*
- *Why is clean water important?*
- *What do we use water for?*

Allow students time to think about and answer the questions.

Next, ask students, *"Has anyone ever heard the word 'pollution'? What do you think it means?"* Allow students to think about and respond to the questions.

After discussing the definition of pollution and using the PowerPoint *Our Water* as a visual guide, pose the following questions to the students and allow students time to answer:

- What is water pollution?
- What types of things can pollute our water?
- What are some examples of pollution that you can think of?
- How hard do you think it is to clean the water after it has been polluted?

As a real-life example of water pollution, you could briefly mention the Deepwater Horizon/BP Oil Spill in 2010. As a result of the oil rig exploding, over 200 million gallons of oil was spilled into the Gulf of Mexico. This caused catastrophic damage to wildlife and ecosystems. The resulting damage effected 1000s of square miles of ocean, took years to clean up, and has cost an estimated \$65 billion dollars.

Explore

After discussing the answers to these questions, explain the next activity as follows (use the PowerPoint for visuals):

"Cruel Carl has dumped a lot of oil in waters within the Town of Oceanside. Now, the town's drinking water is contaminated, and the animals that live nearby are suffering. Help the townspeople fix what Carl has done! We are going to try to figure out how to separate oil and water. If we can figure that out, we can help the people of the Town of Oceanside remove the oil from their waters and make it clean again!"

Be Sure Students Understand:

Less than 1% of all water on earth is freshwater. All other water is either frozen permanently or is saltwater.

Clean, fresh water that can be used by humans is limited and, therefore, very valuable.

Information About Pollution:

Pollution occurs when harmful or poisonous substances are introduced into the environment.

Water pollution occurs when harmful or poisonous substances are introduced into Earth's water environment, such as lakes, streams, rivers, and oceans.

Water pollution can be harmful to the creatures that must have water to survive, including fish, animals, and plants.

Anything we put on the ground or in the sky will eventually end up in our water (because of the water cycle). Some specific substances include, but are not limited to raw sewage from humans or animals, chemicals from farms, factories and construction sites, general trash, volcanic ash, sedimentation (from flooding and erosion caused by storms or human activity), oil spills, and algae blooms.

Cleaning polluted water is very difficult, time-consuming, and expensive.



Separate the students into groups and have each group work in a specified area over a drop cloth and catch bin. In each water/soda bottle, mix some water and oil together (use your own discretion when deciding the amount to use). If you wish, you may add food coloring to heighten the contrast between the water and the oil. Aside from trash bags and paper towels, each group will receive the other supplies (2-3 clear cups, funnel, coffee filters, and spoons/utensils).

Explain to the students that their objective is to separate the oil and the water in the mixture using any of the items they are given. When separated, clean water should be in one of the clear cups while oil should be placed in another. The process for separating the oil and the water is up to them. Although, caution the students to be careful and try not to lose the water or oil by spilling it (this is bound to happen however). As much as you can, walk around and monitor group progress. After a little time has passed and groups have made a sufficient effort to separate the water and oil, move on to the next portion of the activity.

For the next part of the activity, give each group of students a bottle of water and a small section of pre-oiled PVC pipe (rub some vegetable oil on the inside of the pipe beforehand). Then, explain to the students, "*Now, Cruel Carl has poured oil and grease down many of the sink drains in town! Our objective now is to try to clean off as much of the oil inside the pipes as possible using just water.*" Allow the students to do this over a catch bin until they run out of the water in the bottle. After the water runs out and students have observed the amount of remaining oil in the pipe, have all the students clean up their area and hand back the materials.

Alternative to Explore Activity:

Instead of having groups of students perform the oil and water separation activity, perform the activity as a demo and have the students tell you how to attempt to separate the water and oil.

Rather than having each group of students perform the PVC pipe cleaning activity, do this as a class and let two or three students try to clean the pipe with water as the rest of the class observes.

After the Activities and Discussion, Students Should Understand:

- Once oil has been introduced, water is very hard to clean. It is very hard (and in their case likely impossible) to completely separate all of the water from all of the oil.
- When anything other than water is poured down the sink (especially Fats, Oils, and Grease referred to as FOG), it is carried downstream where it may cause water pollution.
- Furthermore, FOG sticks to the walls of sewer pipes and builds up over time (like the pipes they attempted to clean). This can cause pipe clogs, blockages, backups, and sewer overflows in homes, businesses, schools, and the surrounding environment (GROSS)! As a result, public health and environmental health can be negatively impacted.
- In order to keep pipes clean and clear, never pour anything but water down the drain. Keep FOG out of your sinks. Put FOG in the trash.



Explain

With the class as a whole, discuss the amount of success all of the groups had when it came to separating the oil and water.

- *Was it easy to separate the oil and water? Was it hard? Why?*
- *Were any of the groups able to completely separate the two?*
- *Were you able to clean all of the oil off of the pipe? Was it easy or hard? Why?*
- *What do you think happens to your pipes when you pour substances other than water down your sink at home? Where do those substances end up?*
- *Why is it important for your pipes to be clean and clear?*
- *What steps can you take to make sure your pipes at home stay clean and clear?*

Elaborate

Next, ask students, *"In the story, Cruel Carl poured oil in the waters of the town, which caused the waters to become polluted. What would have happened if Cruel Carl poured the oil on the ground instead? Would he still cause pollution?"* Allow the students to share their thoughts.

After students have shared their thoughts, show them the container you created in advance of the lesson. Explain that the gravel represents land surrounding a body of water. Next, place some drops of red food coloring near the top of the gravel (be sure not to use too many drops because you don't want the food coloring to flow down into the water yet). Explain that the food coloring is pollution that has been poured out on the land. Then, using a spray bottle filled with water, make it "rain" on the gravel. Food coloring should flow downhill into the body of water and some should flow down into the gravel.

Refer back to the Water Cycle and its stages. Explain that as water turns from vapor to liquid and falls as precipitation, it often falls on land. From there, the water drops either soak into the ground or flow downhill, eventually reaching streams, rivers, lakes, or other water bodies (this stage is the collection stage). As it flows or soaks into the ground, water may pick up anything along its path. So, if oil (or any other harmful

After the discussion and video, be sure students understand the key points:

- Pollution, specifically water pollution, is harmful to the environment and people. It causes the water to become dirty (even poisonous) and is not easily fixed.
- Surface and groundwater can become polluted when chemicals enter the water during runoff/collection.
- As water flows along the ground or soaks into the ground, whatever is on the ground may be picked up by the water and end up polluting collected water bodies.
- Anything that we put on the ground, down the sink, or in the air will eventually end up in the water. It is very important to restore and protect the clean water around us.
- Humans can cause water pollution in many ways, either intentionally or unintentionally. This can cause habitats to become too polluted for other organisms to use. As a result, animals and plants may die (due to lack of resources), migrate to other areas, or adapt in other ways.



substance) is poured on the ground, it can still reach and pollute nearby water sources. Would you want to drink that?

Then, show the students the water pollution video. Summarize the key points.

Evaluate

Use the quiz questions provided in the *Our Water* PowerPoint as a knowledge check. By the end of the lesson, students should know:

- The definition of water pollution
- The common sources of water pollution
- The effect of water pollution on the environment
- The effect of water pollution on people

Resources

- Buosso, R. (2018, January 16). BP Deepwater Horizon costs balloon to \$65 billion. Retrieved March 24, 2020, from <https://www.reuters.com/article/us-bp-deepwaterhorizon/bp-deepwater-horizon-costs-balloon-to-65-billion-idUSKBN1F50NL>
- Pallardy, R. (2020, March 13). Deepwater Horizon Oil Spill. Retrieved March 24, 2020, from <https://www.britannica.com/event/Deepwater-Horizon-oil-spill/Environmental-costs>
- "Support Guide 3.0 for First Grade." South Carolina Department of Education Office of Standards and Learning, June 2018.

For More Information and Feedback:

We value your feedback on this lesson, including how you use it in your formal/ informal education settings. Please send your comments to:
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Acknowledgements:

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